# Pedagogical approaches

## and
## learning
## activities

### Institut de **développement** et d'**innovation pédagogiques** | IDIP
### Université de Strasbourg

## to strengthen
## the research-teaching nexus

# Research-based skills Framework



Figure 1 : Research-based skills framework

*This research-based skills framework is based on the following frameworks :*

Ministère de l'Enseignement supérieur, de la Recherche et de l'Innovation. Arrêté du 22 février 2019 définissant les compétences des diplômés du doctorat et inscrivant le doctorat au répertoire national de la certification professionnelle (2019). https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000038200990&categorieLien=id

Ministère de l'Éducation nationale et de la Jeunesse. (2011). Répertoire des métiers de l'éducation nationale, de l'enseignement supérieur et de la recherche. https://www.education.gouv.fr/cid56479/repertoire-des-metiers-de-l-education-nationale-de-l-enseignement-superieur-et-de-la-recherche.html

Vitae. (2010). Researcher Development Framework. https://www.vitae.ac.uk/vitae-publications/rdf-related/researcher-development-framework-rdf-vitae.pdf/view

# | Blocks of scientific skills for the undergraduate to doctoral student |

Distinct stages of development or levels of performance will be defined by each pedagogical team for each block of skills, depending on the level of training.

## Design research

The graduate identifies and solves complex problems by mobilizing the most advanced knowledge. He or she designs research projects with an innovative approach.

## Scientific foresight

The graduate is able to acquire and synthesize international scientific and technological data and information. He or she understands and analyzes information with a critical view, is curious and openminded.

## Implement research

The graduate applies research methods and tools, processes data and is able to evaluate his approach and results. He or she demonstrates organization, autonomy and adaptative capability.

## Coaching & supervision

The graduate works collaboratively, participates in and contributes to collaborations and external relationships. He or she is able to lead and coordinate a team in complex or interdisciplinary tasks/projects with a long-term strategic vision.
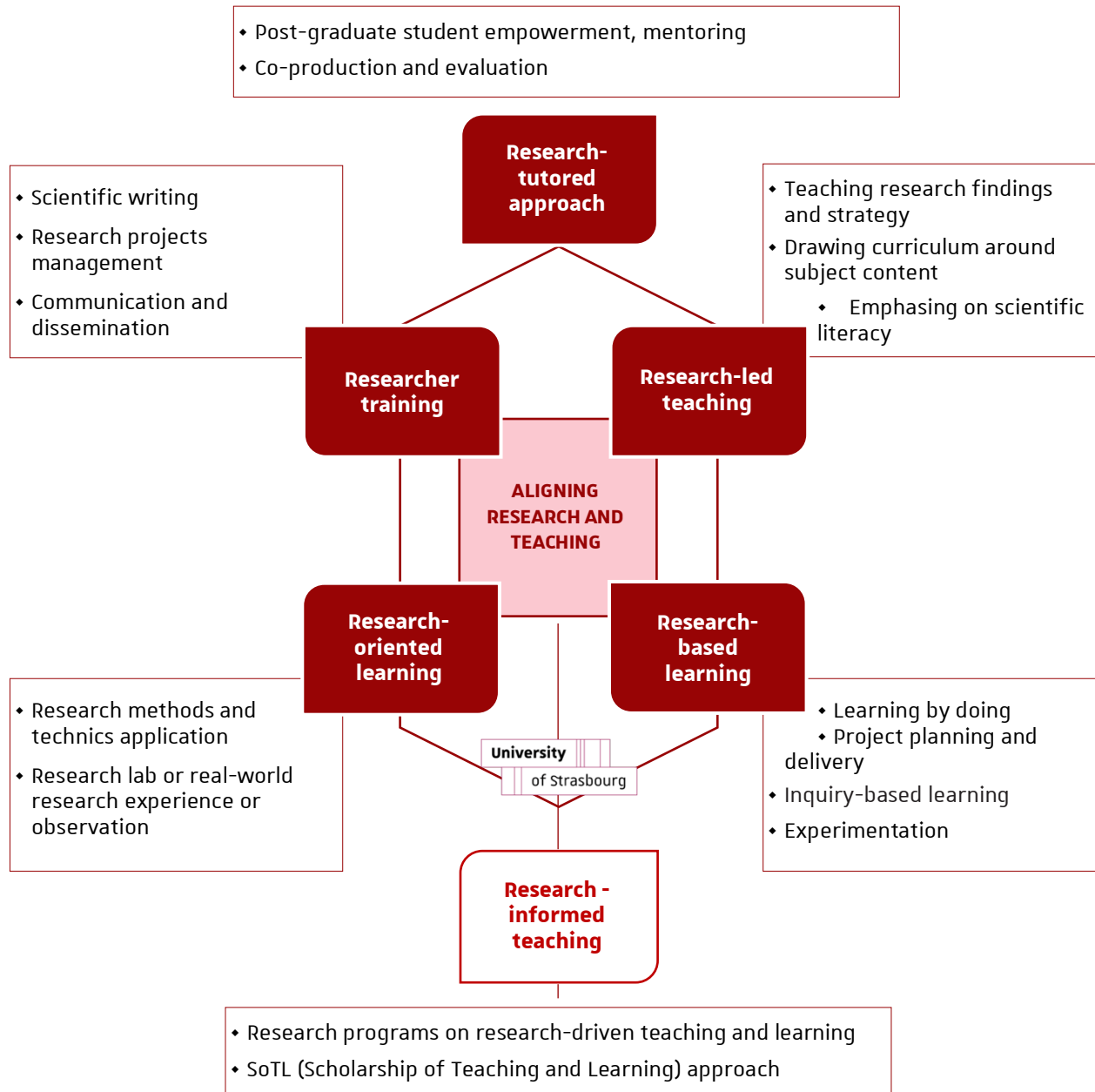
## Promote & capitalize on results

The graduate is able to implement issues of transfer for exploitation and valorization of results in economic or social sectors, to contribute to Open Data. He or she develops scientific and professional cooperation networks at an international level. He or she behaves in accordance with scientific integrity and ethics.

## Disseminate & teach

The graduate is able to report and communicate scientific and technological work in several languages, is committed to disseminating knowledge to broad audiences. He or she has skills to teach different learner profiles and knows how to mentor students.

# The Teaching-Research Nexus

*The Teaching-Research Nexus is a framework that shows and combines different existing approaches to enhancing the link between research and teaching/learning in higher education. This framework is based on scientific literature and experimental programs. Each approach is often led separately in a class, a level or a program. We aim to implement the whole approach of the framework gradually to guarantee that our learners will develop the skills required in conducting research. This framework will help us design our training programs and pedagogical approaches for students, researchers and teachers-researchers.*

- Post-graduate student empowerment, mentoring
- Co-production and evaluation

**Research-tutored approach**

- Scientific writing
- Research projects management
- Communication and dissemination

**Researcher training**

- Teaching research findings and strategy
- Drawing curriculum around subject content
    - Emphasing on scientific literacy

**Research-led teaching**

**ALIGNING RESEARCH AND TEACHING**

**Research-oriented learning**

**Research-based learning**

- Research methods and technics application
- Research lab or real-world research experience or observation

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- Learning by doing
- Project planning and delivery
- Inquiry-based learning
- Experimentation

**Research-informed teaching**

- Research programs on research-driven teaching and learning
- SoTL (Scholarship of Teaching and Learning) approach

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*This teaching-research nexus model is based on the following propositions :*

Jenkins, A. & Healey, M. (2005). *Institutional strategies to link teaching and research: Full report*. York : The Higher Education Academy. https://s3.eu-west-2.amazonaws.com/assets.creode.advancehe-document-manager/documents/hea/private/resources/id585_institutional_strategies_to_link_teaching_and_research_2_1568036784.pdf

McLinden, M., Edwards, C., Garfield, J., & Moron-Garcia, S. (2015). Strengthening the Links Between Research and Teaching : Cultivating Student Expectations of Research-informed Teaching Approaches. Education in Practice, 2, 6. https://intranet.birmingham.ac.uk/staff/teaching-academy/documents/public/eip-dec15/mclinden.pdf

University of South Carolina. (2019). Linking Teaching and Research—Center for Teaching Excellence | University of South Carolina. https://www.sc.edu/about/offices_and_divisions/cte/teaching_resources/maintainingbalance/link_teaching_research/index.php
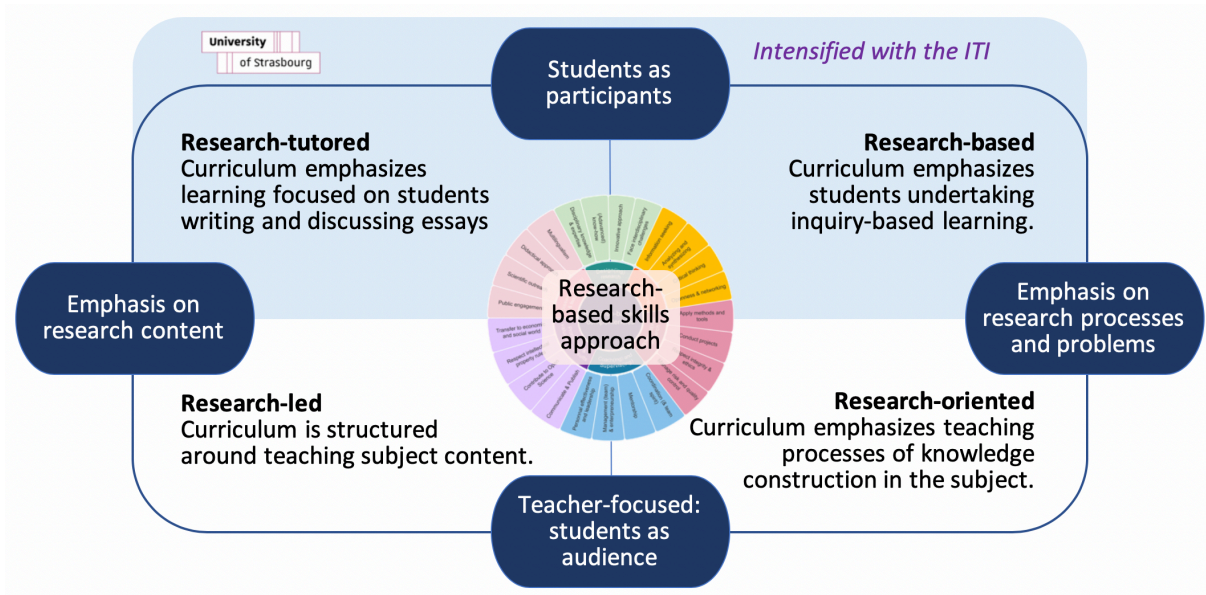
Figure 2 : Adaptation of Healy, in Barnett (2005) curriculum design and the research-teaching nexus

# Developing pedagogical approaches
# to enhance the research–teaching nexus

| Research-based learning - objectives | LMD | blocks of scientific skills |
|---|---|---|
| Objective 1 \| First steps in research within the bachelor's degree | L | Scientific foresight  Design research  Implement research |
| Objective 2 \| Develop a scientific background | LM | Scientific foresight  Design research |
| Objective 3 \| Experimentation and immersion in research | MD | Design research  Implement research  Coaching & supervision |
| Objective 4 \| Interact with different research communities | MD (P) | Scientific foresight  Design research  Implement research  Coaching & supervision  Disseminate & teach |
| Objective 5 \| Develop & mature a professional project | MD (P) | Promote & capitalize on results  Coaching & supervision  Disseminate & teach |

L stands for Licence (Bachelor), M for Master, D for doctorate and (P) for post-doc

## Objective 1 | First steps in research within the bachelor's degree |Bachelor

| Learning activities ▶ | Research-based skills targeted |
|---|---|
| ➲ **Research discovery modules**<br>➲ **Interventions-collaboration with Outreach**<br>➲ **First experimentations modules**<br>➲ **Learning by doing** | `Scientific foresight` `Design research` `Implement research`<br>Student will be able to :<br>• use scientific knowledge; to identify and answer problems<br>• retrieve, gather and synthesize information; process data<br>• apply appropriate research methods and techniques<br>• analyze and demonstrate with critical thinking<br>• behave in accordance with scientific integrity |

## | Objective 2 | Develop a scientific background |Bachelor - Master

| Learning activities ▶ | Research-based skills targeted |
|---|---|
| ➲ **Lectures**<br>➲ **Scientific writing**<br>➲ **Flipped classrooms**<br>➲ **Web-conferences**<br>➲ **Seminars provided by ITI Chairs and/or visiting professors** | `Scientific foresight` `Design research`<br>Student will be able to :<br>• have a deep and holistic understanding of intellectual developments in discipline/research area<br>• critically synthesize new and complex information from diverse sources<br>• evaluate oneself in order to develop personal learning environment<br>• provide scientific foresight<br>• discover cutting-edge digital techniques and tools<br>• have intercultural curiosity<br>• develops awareness of the impact of research<br>• build collaborative relationships |

## | Objective 3 | Experiment and immersion in research | Master - PhD

| Learning activities ▶ | Research-based skills targeted |
|---|---|
| ➲ **Workshops**<br>➲ **Scientific project challenges**<br>➲ **Project-based learning**<br>➲ **Professional immersion, training and internship periods**<br>➲ **Mentoring and peer learning** | `Design research` `Implement research` `Coaching & supervision`<br>Graduate will be able to:<br>• apply scientific methods and techniques<br>• process data<br>• lead scientific experiments<br>• evaluate scientific practices<br>• work in a collaborative and interdisciplinary setting<br>• analyze with a critical mind<br>• develop intercultural curiosity |

## |Objective 4 |Interact with different research communities|Master- PhD - (Post doctorate)

| Learning activities ▶ | Research-based skills targeted |
|---|---|
| ➲ **Interdisciplinary seminars**<br>➲ **Summer schools**<br>➲ **Interdisciplinary project challenges**<br>➲ **Mobility, international exchanges**<br>➲ **Resident researchers**<br>➲ **Participation to  international congresses/colloquia/conferences** | Scientific foresight   Design research   Implement research   Coaching and supervision   Disseminate & teach<br>Student will be able to :<br>▪ develop intercultural curiosity<br>▪ build interdisciplinary cooperation<br>▪ develop an open-minded approach<br>▪ communicate in different languages |

## | Objective 5 | Develop & mature a professional project| Master – PhD – (Post-doctorate)

| Learning activities ▶ | Research-based skills targeted |
|---|---|
| ➲ **Advising & soft skills training** (leadership-management, communication, networking, meetings with alumni)<br>➲ **Participating in Career Fair & Days**<br>➲ **Portfolio "skills & employability"**<br>➲ **Immersion in different organisations**<br>➲ **Peer learning**<br>➲ **Tech transfer & entrepreneurships modules** | Promote & capitalize on results   Coaching & supervision   Disseminate & teach<br>Students will be able to:<br>▪ promote skills<br>▪ communicate effectively<br>▪ build professional networks and identify career opportunities<br>▪ act as leaders and work in groups with integrity<br>▪ manage career progression<br>▪ Identify development needs |